ment will be apparent to all geologists and mining engineers, and it is to be hoped that similar cooperation on work relating to other state problems will be effective in the near future.

F. W. DEWOLF,
Secretary

SPECIAL ARTICLES

ON THE ACOUSTIC EFFICIENCY OF A SOUNDING BOARD

THE experiments described below appeared to yield such a variety of information, of so definite a character, that it seemed worth while to record them, in spite of their simplicity.

The chapel of Adelbert College, built in 1910, had proved unsatisfactory in its acoustic properties. The architect prescribed a sounding board, as likely to remedy the defect, and sent a sketch embodying his suggestion. It was thought worth while to make a preliminary test before erecting a permanent sounding board, and the writer was asked to take charge of the matter.

The chapel is a building of late English Gothic type. The nave is 104 feet long, with narrow and low side aisles, barely 6 feet wide, including the massive piers. The width of the nave, not including the aisles, is 30 feet. The chancel is 34 feet long and 30 feet wide, without aisles. The chancel floor is raised about 16 inches above that of the nave. Thus the general shape of the building is a long and narrow rectangle, 140 feet by 30, with no important recesses or irregularities. The ceiling is arched, about 48 feet high to the top of the arch. Its curvature is such that any focal line which might be formed by reflection would be not near the floor, but high up in the auditorium.

Experiments gave little evidence of local echo or interference. The acoustic difficulties arise chiefly from general reverberation. The problem was then to determine by direct comparison the value of a sounding board as a corrective of general reverberation.

It is evident that the experiments must be of such a kind as would appeal not merely to a physicist, but to any intelligent person. This means that they must be comparable with the ordinary use of the chapel, and must involve the hearing of ordinary speech. Yet it was of course desirable that they should have some quantitative character, and that the individual and personal characteristics of the hearers should be so far as possible eliminated or averaged.

Several members of the college faculty and two or three advanced students gave their cordial assistance. To their patience and carefulness is due whatever of value these experiments may have.

Three speakers took part, differing greatly in characteristics and in quality of voice, but all accustomed to public speaking.

It is a commonplace that ordinary speech is understood largely by context and association throughout a whole sentence rather than by actual hearing of the individual words. To eliminate this factor, lists of unconnected words were read from a spelling book, at a rate and with intonation similar to that used in a connected passage. One who has not tried this can hardly realize how much we rely on association in listening to an address. In order that this association-factor might not be left entirely out of account, a passage from some oration (always the same oration in any one set of experiments) was read in addition to the spelling-book list.

Three rows of seats on the floor, and the front row of the gallery at the back of the house, were selected as representative of the whole auditorium. The seats on the floor were the seventh, fourteenth and twenty-first from the front, and were called in the tests *G*, *N* and *U*, respectively. The position of the listener in any one row of seats, whether in the middle or on either side of the chapel made no apparent difference in the ease of hearing. The speaker was equally well heard from any part of the row, whether he stood in the pulpit, or in the middle of the front edge of the chancel floor. These facts were established by experiment before the sounding board was put in place.

The sounding board, made after the design of the architect, was of the horizontal type

now generally considered most effective. The horizontal board was hexagonal, six feet in diameter (radius of the inscribed circle), surrounded by a vertical rim which extended six inches below the plane of the board. It was supported at a height of a little more than two feet above the head of the speaker.

After a considerable number of preliminary trials, all of the same general character, a final comparative test was conducted as follows:

Eight hearers assisted, distributed through seats *G, N, U,* and the gallery. The speaker stood in his appointed place, and read a list of disconnected words from a spelling book, while each hearer noted down the number of words not understood. The speaker then read a short passage, of a known number of words, from the chosen oration, the hearers noting, as before, the words missed. The hearers then changed places, those in *G* going to *N*, those in *N* to *U*, etc., and again a list of words was read from the spelling book, and a passage from the oration. This was continued until each of the eight hearers had sat in each of the assigned seats. The number of words understood by a hearer in a given seat in any one trial was expressed as a percentage of the whole number read during that trial. The average of the percentage numbers for all the eight hearers was taken as the acoustic efficiency of the seat.

Two such sets of experiments were made, the speaker standing, in experiment I., at the front edge of the chancel floor, in the middle; in experiment II., in the pulpit, under the sounding board.

	G	*N*	*U*	Gallery
Unconnected words:				
I. On chancel floor..	96	89	80	66
II. In pulpit.....	98	91	82	62
Connected discourse:				
I. On chancel floor..	99+	98+	95	80
II. In pulpit.....	100	99	96	80

The two sets of experiments should be strictly comparable, as they were made in the same afternoon, and involved the same speakers and the same hearers in the same places. The results follow. The figures represent in each case the average percentage of words understood by the eight hearers.

These results seem to show that the beneficial effect of a sounding board in this place is very small or inappreciable. This is perhaps no more than was to be expected, for it is difficult to give any reason why a sounding board should greatly diminish the reverberation in an auditorium.

The experiments described afforded a considerable amount of other information, with regard to the most advantageous pitch of the speaker's voice, the rate of speaking, and other phases of the subject, but as such results would apply only to the auditorium studied and would have no general value, they have not been discussed.

Frank P. Whitman
Western Reserve University,
October 25, 1913

THE AMERICAN CHEMICAL SOCIETY

ROCHESTER MEETING

III

DIVISION OF PHARMACEUTICAL CHEMISTRY

B. L. Murray, *Chairman*

F. R. Elred, *Secretary*

B. L. Murray: *Chairman's Address. Legislation Affecting Pharmaceutical Chemistry.*

A. W. Bender: *The Determination of Mercuric Iodide in Tablets.*

Several methods and modifications of methods were tried on the tablets with very unsatisfactory results. The difficulty experienced was due in a large measure to the other ingredients in the tablets, namely, terra alba, potato starch, talc and gelatine. The method which was finally found to give satisfactory results is a modification of the sulphide method.

The method consists in dissolving the mercuric iodide by the use of HCl and $KClO_3$, filtering, making the filtrate alkaline with ammonia, and precipitating with H_2S.

The method was also found to be useful for the assay of mercuric iodide and oleate of mercury.

J. B. Williams: *The Insecticidal Value of Fluid Extract of Larkspur Seed.*

Fluid extracts of larkspur seed on the market at the present time show great variation in physical, chemical and insecticidal properties.

Fluid extracts obtained by extracting the seed